The Pakistan Development Review
44 : 4 Part II (Winter 2005) pp. 597–614

A Review of the Relationship between Poverty, Population Growth, and Environment

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I. INTRODUCTION

Deterioration of natural resources during the past few decades has come to prominence as one of the most important current global issues [Desta (1999)]. Increase in population density in ecologically fragile areas and consumption of non-renewable natural resources at high rates is seen as one of the leading causes of this deterioration [Grigg (1991)]. At present, in some of the developing countries, the pollution of air, water and soil has reached life-threatening levels [Gilbert (1991)]. In many of these countries population pressures, socio-political conditions and economic arrangements have resulted in massive natural resource depletion [Ahmed and Mallick (1999)].

In a developing country, poverty is the major factor that distorts the population transition in response to food supply [Aziz (2001)]. Pethe (1982) suggested that the best way to reduce poverty is to bring fundamental changes in society. The magnitude of this task can be seen readily, if we look at some of the basic dimensions of poverty [World Bank (1998)]:

- Nearly 3 billion people or half the world total population is poor and live on less than US$2 a day.
- About 40 percent of these or 1.2 billion people are extremely poor and have to subsist on less than US$1 a day.

The Copenhagen Summit on Social Development, held in March 1995, adopted the target of a 50 percent reduction in the proportion of people living in extreme poverty by the year 2015 [United Nations (1995)]. Poverty also has a direct relationship with environmental deterioration due to its influence on population growth rates. Under the prevailing condition of poverty, people would not be able to afford the financial cost of conservation of natural resources [Todaro (1994)]. An example of this occurs, when demand for fuelwood increases in towns and small urban areas. The adjoining rural areas see a short-term economic gain by meeting

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this demand. They supply an increased amount of firewood or animal dung to these small urban centers. This leads to deforestation and loss of a valuable fertiliser resource, thereby resulting in reduced agricultural productivity [Goodstein (1995)]. Having many children may bring a family out of absolute poverty, but the burden on national government to provide them with basic facilities like water, sanitation, education and health is beyond its capacity [Lean and Hinrichsen (1992)].

This argument implies that once the condition of poverty is removed there would be a reduction in reproductive rates for the population that was living in poverty. UNFPA on the other hand focuses on the lowering of reproduction rates for people living in the condition of poverty rather than to improve their economic wellbeing [Cook (1994)]. Both policies might have similar results in the long term; however, in the short term it means that the poorest of the population loose all influence over their reproductive behaviour which could result in social unrest and female foeticide. Examples are the compulsory sterilisation practiced in India during the 1970s and the one child policy in China also during 1970s. The result in China was that most families opted for a son and thereby large scale female foeticide resulted in a population imbalance; in 1992 China had a sex ratio at birth of 114 males to 100 females [Aird (1994)].

In this context, the paper presents a review of debate on the relationship between poverty and population and environment, how the various schools of thought approach this problem. Both Boserupians and Dependency Theorists agree that poverty and population growth rates have strong links, but they see poverty as the cause of high population growth rates, whereas the Malthusians see poverty as an effect of high population growth rates. Due to this ideological difference these schools suggest divergent policy options to reach the common goal of sustainable population growth.

To further analyse some of these issues, this paper is structured as follows: The following section presents a review of literature on population, poverty and environment relationship. Section II discusses the various schools of thought regarding the population and environment. Section III presents the empirical evidence regarding demographic transition in Asia. Section IV presents some concluding remarks regarding this debate.

II. THE SCHOOLS OF THOUGHT ON POPULATION AND ENVIRONMENT

Since the gathering of representatives of more than 178 nations at Rio de Janeiro in 1992 for UNCED (United Nations Conference on Environment and Development), there continues to be a lively debate regarding the relationship between population growth, economic development and the natural environment.

Different schools of thought give very different perspectives on the relationship between population, economic growth and the environment. These

perspectives can be as far apart as Malthusian and Boserupian or as similar as the Neoclassical Economists and the Dependency Theorists [Cleveland (1998)]. There are vast differences in some of the basic assumptions made by these schools but still they cannot be deemed mutually exclusive as each presents only a partial view of this very complex relationship [Boserup (1996)].

The Neo-Malthusians, mainly ecologists and biologists, predict future disasters are unavoidable unless the population surge is controlled in time. On the other hand, the New classical Economists predict that human ingenuity would be able to overcome resource scarcities [Stevens (1994)].

II.1. Malthusians

The Malthusians are of the view that natural resources are limited and sooner or later the human population will exceed the carrying capacity of the planet. The primary focus of this group is to reduce population growth rates in rapidly increasing population regions of developing countries.

For the Malthusians, the population densities and high growth rates within these densely populated areas have special significance. They argue that it is difficult to maintain a high living standard in a densely populated area with a high rate of population increase. The reason is that due to the rapid growth of the population, adjustment time is too short for new technology to be adapted. The result is continuous degradation of the natural environment.

They may not agree with the original Malthusian thesis presented in 1798 by Thomas Malthus which, stated that the population grows at an exponential rate whereas food supply grows in a linear progression. However, Malthusians do believe that natural resources are limited and that the carrying capacity is finite and decreasing. As a result, they see population growth anywhere beyond this carrying capacity may have dire consequences for everyone.

Present-day followers of the Malthusian ideas present a synthesis of traditional Malthusian concerns and contemporary environmentalism. They argue that even if the growing population could be provided with food now, eventually the population explosion would completely ruin the fragile environment of this planet and sufficient food supplies would not be available for all. In a recent study of 36 countries from sub-Sahara Africa it was evident that the Malthusian mechanism was at work in the population-agriculture-environment relationship [Drechsel, *et al.* (2001)].

Followers of the Malthusian doctrine also believe that rising income leads to a lowering of population growth rates and that these might not be applicable in developing countries mainly due to poverty. They argue that the developing countries are stuck in a vicious cycle of poverty. High incidence of poverty leads to high birth rates which in turn lead to a continuing high proportion of the population living in poverty. To experience a demographic transition similar to the developed

countries it is important to have aggressive population control methods implemented together with economic growth policies [Goodstein (1995)].

The followers of socio-biological ideas take the Malthusian concerns to an extreme level with demands for immigration control and reduction of foreign aid to the developing countries. They reason that foreign aid needs to be reduced otherwise it would stimulate high population growth rates in developing countries and reduce the infant mortality rates. The supporters of this school of thought also emphasise the differential rates of fertility between developed and developing countries could stimulate friction in the future due to the distributional issues related to income and other material resources. The imbalance in population growth rates is also perceived as a potential threat due to the increasingly aging population in the developed countries [Furedi (1997)].

II.2. Neoclassical Economists

Alfred Marshall was one of the founders of Neoclassical Economics. He was one of the first to consider the contribution made by nature to the production of goods and services [Lutz (1993)].

Neoclassical economists believe that perfectly competitive open markets can reach optimal economic outcome for both producers and consumers. An increasing population represents increasing demand which in turn represents expanding markets. Expanding markets generate wealth and this takes the form of improved living conditions and technological improvement. Hence in the absence of market distortions, increasing population represents expanding economic activity and wealth. The concern of the neoclassical economists however is whether the standard of living can be maintained under the condition of increasing population. They consider that markets functioning free of distortion are capable of maintaining the standard of living even with increasing population [Jolly (1994)].

With efficient market conditions and increasing population, the neoclassical economists see two outcomes, which will overcome the limits to growth due to non-renewability of natural resources. The first is to substitute the natural resources with man-made resources and the other is to improve technology for the more efficient use of natural resources. When natural resources become scarce in an efficient market, both producers and consumers substitute other resources like labour and man-made resources for natural resources. They argue that degradation of both land and other natural resources is due to inefficient market structures. If a market was not functioning properly then it would not be able to set a real price for natural resources. If it is unable to price this commodity properly, the chances are that it would be overused and hence, degraded [Thampapillai, *et al.* (2000)].

The issue that concerns neoclassical economists is the continuing reduction in wages due to continuing increase in labour supply. They think that if other factors of production are unable to keep pace with one rapidly increasing factor of production

e.g. labour, then the price of labour would go down. If there were limits to expansion of other factors of production then the rate of increase of labour would only reduce its value compared to other factors of production. Therefore, stabilised population growth rate would result in stable returns to labour.

For the neoclassical economist, decrease in the human fertility rate is not the only, nor indeed the main solution to maintenance of natural resources. Making markets efficient, so that they can set prices more efficiently is fundamentally more important. They acknowledge that reduced fertilities leave more time in the critical adjustment period and new technologies can be adopted in that time to reassure proper maintenance of natural resources [Jolly (1994)].

Some neoclassical economists present the population transition of Western Europe as a three-stage model [Oded and Weil (1999)]. The first stage is Malthusian, the next is post-Malthusian and the third is Modern.

In the first stage technological development is very slow, therefore, the increase in both income and population, while positive, is very low. In the post-Malthusian period, the rate of increase in income accelerates but there is still a positive relationship between increase in income and increase in population. The reason given is that as income increases so does the standard of living. As health and wellbeing improves the mortality rate decreases, even with a constant fertility rate; the net increase in population is positive and accelerating. This is a pure income effect when income and substitution effects are considered in terms of economic theory.

By the end of the 1800s population growth rate started to fall in Western Europe. This was a time of rapid technological improvement and as a consequence, a rapid increase in income. The background for this final stage of transition is the increased rate of return to human capital. This influenced the family's decision to substitute quality for quantity of children [Oded and Weil (1999)]. In the final stage the population growth rate slowed but the rate of increase of income continued to accelerate. The returns on human capital increased to such a level that minimal numbers of offspring guaranteed continued increase in total income in the family and hence in the economy.

The reason for a slow down in the population growth rate, when income increased at an accelerated rate, is due to the fall in mortality rates particularly the mortality rate of children. As the probability of a child reaching maturity increased, this resulted in decreased fertility, where children's quantity has been substituted by quality. Fertility also fell due to the substitution effect. For women the opportunity cost of raising children became very high as employment and other opportunities opened up for them elsewhere. They eventually substituted high personal income for large family size. This is the substitution effect in economic terms. A study using historical data (1880-1910) shows that the decline in infant mortality was the basis for fertility decline [Sanderson (2001)]. The same study also shows that

empowerment of women was not the reason for fertility decline, rather the decline in fertility empowered women to pursue economic interest.

If the same economic explanation is applied to the demographic pattern in the developing countries, a very clear picture emerges. In most developed countries technological development was low for a long period of time. Mortality rates continued to stay high together with reasonably high fertility rates. The net result was a slowly growing population. However, with the transfer of technology from the developed countries to the developing countries the natural transition was disturbed. The income distribution that was unequal to begin with became even further skewed. For the population in the top income bracket the income effect became much more significant than the substitution effect. The net result was an increase in the fertility within that income group. However, for the population in the low-income bracket, mortality rates did not decline in the same proportions as it did in other income groups. To counter the effect of high mortality rates, the fertility rates stayed high that resulted in continued high net fertility rates in the lowest income groups.

The population in the middle income groups in developing countries showed results similar to the demographic transition experienced in the Western Europe. The substitution effect became significant in these groups outweighing the income effect. The net result was decrease in fertility. The developing countries, which were able to increase the impact of this substitution effect, were able to reduce their population growth rates significantly. Other developing countries are still struggling with skewed income distributions and high fertility rates.

II.3. Boserupians

The Boserupians believe in Induced Intensification thesis [Turner and Ali (1996)]. In 1965 Ester Boserup presented her provocative thesis of agricultural change. She argued that in an agrarian scenario, when there is an increase in demand for food, producers intensify the production process [Winfrey and Darity (1997)]. Boserup's thesis concludes that as certain resources become scarcer e.g. land, technology is adopted that uses more intensively the relatively more abundant factor (labour). Rapid population growth in this case spurs economic development [Cleveland (1998)]. Given these assumptions, there is a real possibility of land degradation in the short term. Since there is a time lag between increase in the population and adaptation of new technology, land degradation could be visible during the "critical transition stage" [Jolly (1994)] when the population adjusts to improved technology.

Boserupians believe that population pressure on limited natural resources induces resource efficient technology. This belief is based on the assumption that carrying capacity is fluid and may be increased by converting to technologies that conserve natural resources. Boserupians and Neoclassical Economists both make a common assumption namely, the substitutability of factors of production.

Boserupians who follow the Developmentalist perspective believe that with increased prosperity and improved lifestyle, demand for a larger family would decrease. This means that in regions with low-incomes and high population, economic development would thereby reduce the population growth rates. On the other hand, Boserupians with re-distributionest inclination believe that high population growth is the effect of poverty rather than the cause of it. Adverse economic conditions and high mortality rates of children force people to have large families. In order to reduce the size of families in this section of the population, it is necessary to first change their economic condition [Furedi (1997)].

One group of Boserupians, which follows human rights perspective, thinks that exclusion from power and decision making regarding their fertility has resulted in high fertility rates for women living in poverty. Provision of reproductive health services along with empowerment could both result in the lowering of fertility rates. Feminists are strong supporters of this school of thought all over the world.

Another group of Boserupians, who perceive people as problem solvers, believes that because people do have problem solving skills they would be able to overcome limitations to growth in the future. This approach is also closely followed by Paul Harris in his book "The third revolution: population, environment and a sustainable world" (1993). He believes that market mechanisms would ultimately establish equilibrium between population growth and resources.

II.4. Dependency Theorists

Dependency Theorists assume that population pressure is a direct cause of environmental degradation, in fact poverty and unequal distribution of resources is causing both environmental degradation and a persistent increase in population. The argument put forward is that in certain parts of the world both Boserupian and Malthusian theories are unable to explain the relationship between population and the environment due to the pivotal role played by poverty in this relationship. Elimination of the conditions of poverty rather than trying to control the reproductive rates of people living in poverty would bring natural progression in demographic transition. A reduction in the number of people living in poverty, by slowing their reproductive rate would not eliminate the root cause, 'poverty'.

Elimination of poverty would occur only with the improvement in the living conditions of the low-income group. Coercing families living in abject poverty to have fewer children is only a short-term solution to reduce the number of people living in poverty. Fewer children with no change in economic well being, no social security net and without any assurance that a smaller family size would ensure survival and sustenance would not bring any meaningful change as a result of reduced fertility.

Dependency Theorists believe that poverty, inequality in wealth and resource allocations are all causing population pressures. If people were economically secure they would have no need for large families. In developing countries, for people

living in the condition of poverty, children represent their only superannuation. The condition of poverty has to be removed in order to follow the natural course of demographic transition. Demographic transition is in three phases:

(i) High birth and high death rates;
(ii) High birth and low death rates; and
(iii) Low birth and low death rates.

There is a complex link between rising income and slowing of population growth rates. Most of the developing countries are passing through the second phase where the death rates and child mortality rates have fallen due to improved health services but the birth rates are still high due to low levels of income and wide spread poverty. As income levels improve, falls in population growth rates could occur, resulting in a demographic transition similar to the one experienced by the high-income countries of Western Europe and North America.

Dependency Theorists link the skewness of income distribution with distortion in income and substitution effects on population increase. They perceive that the population transition would take its natural course if the distributional issues were resolved properly. According to them, the key to both sustained economic growth and a slowing of the population growth rates lies in the removal of distortion from income distribution.

These dependency theorists argue that people can adopt new technologies to safeguard the natural environment only when they have access to these technologies. If a country is densely populated and has high population growth rates with limited or no access to new and improved technologies, then they would not be able to adopt new technologies to safeguard their fragile natural resources. Degradation of natural resources in that country does not necessarily mean that there is no willingness by its people to take care of their environment. Rather, they are unable to afford any improved technology to maintain the robustness of their environment.

These theorists also believe that the environment has been degraded as a result of over consumption in the developed countries [Furedi (1997)]. Global warming and ozone depletion has been caused by the high rate of consumption of fossil fuels in developed countries. They became acute problems due to the loss of carbon sinks with continued logging of forests in developing countries. These forests were logged as a result of the high demand for timber and other forest products in industrialised countries. The land cleared of forest was being turned into farms to produce products to be sold in industrial countries. Most of the beef sold in the USA for use by hamburger chains is produced in Latin American countries [Hartmann (1994)].

III. EMPIRICAL EVIDENCE

The European fertility transition took more than two centuries to complete. Whereas, countries like Sri Lanka, South Korea, North Korea, Thailand, Kazakhstan,

Iran, Turkey, Tunisia, Mauritius, China, Singapore have completed fertility transition in 2-4 decades. In May of 2003, the *Journal of Population Research* presented an assessment that Asia's fertility decline over the past three decades has been of truly historical significance on a planetary scale. The unexpectedly rapid fertility transition in the continent that is home to more than half of the world's population has brought about a change in circumstance, and perhaps in fortunes of the millions of people that live here. It should be noted that the Asian fertility decline has contributed to improving not only the global prospects, but the conditions of livelihood and well-being among the Asian populations themselves. This population growth rate is not a result of natural disaster or involuntary increase in death rates due to famines, but rather through the voluntary decline in birth rates under conditions of increasing life expectancy and improving material well-being.

It needs to be explored what factors made it possible? Similarly, relatively poorer and more populous countries like India, Indonesia, and Bangladesh are nearing replacement level fertility and may get there before the end of this decade. In many of these countries strong family planning programmes have been noted for independent effect on hastening fertility transition in rather adverse socio-economic conditions.

Table 1

Total Fertility Rates, World and Asia, 1950-2000

Region	1950-55	1955-60	1960-65	1965-70	1970-75	1975-80	1980-85	1985-90	1990-95	1995-2000
World	5.01	4.95	4.97	4.90	4.48	3.90	3.56	3.35	3.01	2.82
Asia	5.88	5.63	5.64	5.68	5.07	4.17	3.66	3.38	2.95	2.70
Eastern Asia	5.68	5.10	5.16	5.43	4.46	3.13	2.46	2.36	1.88	1.76
South-Central Asia	6.08	6.07	6.00	5.86	5.60	5.08	4.79	4.40	3.99	3.58
South-Eastern Asia	5.95	6.15	6.09	6.03	5.53	4.91	4.24	3.71	3.24	2.83
Western Asia	6.40	6.28	6.21	5.94	5.62	5.25	4.98	4.72	4.23	3.86

Source: United Nations (2001). Moriki-Durand (2003).
Total fertility rate (children per woman).

According to the editorial "Fertility decline in Asia: trends, implications and futures", published in *Journal of Population Research* in 2003, fertility decline has largely characterised the Asian population transition over the latter part of the last century. Beginning with the initiation of Japan's transition in the 1930s, fertility declines in other Asian countries soon followed, with levels in Hong Kong, Taiwan and Singapore beginning to fall by the 1960s. The latter part of the 1960s and the 1970s signaled the beginning of transitions in the major Chinese and South Korean cities, as well as the Chinese populations in Southeast Asia. A number of reasons have been suggested for the Asian fertility declines. Declines in most countries have

generally been concurrent with the rise in the pace of industrialisation and relative economic prosperity. Socioeconomic factors such as the spread of education, particularly among women, have been cited as vital to bringing down fertility to below-replacement levels in several Asian countries. The diffusion of contraceptive use arguably plays an important role as well. Many studies have also considered anti-natalist policies by relatively strong-handed governments in many Asian nations as playing a significant role in bringing about the rapid pace of decline.

Fertility decline in Asia is an uneven process, with declines being particularly pronounced in the urban areas, to the point of sub-replacement fertility in some countries. The implications of such trends are wide-ranging, often provoking changes at both the level of the family and at state level. These problems range from the social—changing gender politics within the household—to policy concerns, such as ageing populations and labour shortages. Indeed, Asian governments are beginning to recognise some of the problems of fertility decline, which have significant impacts on the countries that are approaching sub-replacement levels of population, such as Singapore and Japan.

However, due to the complex nature of the phenomenon, Asian countries experience and respond differently to fertility decline. Even as some countries embark on pro-natalist policies in attempts to reverse the phenomenon, marked variations exist within and between countries in the way fertility decline is socially and geographically manifested.

Fertility declines are not uniformly experienced, and differentials continue to exist, whether they are based on ethnicity, educational qualifications, or urban-rural variations. As an important unit in Asian society, the changes in family structure, values and relations need to be examined in order to link the local fertility variations with population policies. Policy actions, however, are also contingent upon whether the country is experiencing sub-replacement fertility levels. For example, in countries such as Indonesia and the Philippines that are experiencing fertility declines but not to the point of below-replacement fertility, the relationship between education and fertility is not as evident as in Singapore, where a Eugenics-based policy was in place in the mid-1980s in attempts to counter the trend of graduate women having fewer children than their less educated counterparts.

There is hence a need to examine the particular contexts of Asian fertility decline that help set in motion social and ideological changes, as well as to embark on a timely re-assessment of the relevance of current theories of fertility decline to the Asian context, and indeed, that of the developing world.

According to Moriki-Durand (2003) fourteen countries in Asia have total fertility rates at or below replacement level. This is more pronounced in China, Japan, the Republic of Korea, Singapore and Thailand. The implications are far-reaching and profound as they affect the age structure of the population, giving rise to population ageing, labour force shortages, increased elderly dependency ratios and

feminisation of the aged population. Evidence from European countries suggests that although fertility may rebound, in most countries it is highly unlikely that fertility will recover sufficiently to reach replacement level in the near future.

During the past 50 years, Asia has experienced a remarkable decline in fertility and mortality. The total fertility rate (TFR) of around six children per woman in the period 1950-1955 dropped by more than half to 2.7 in the period 1995–2000. The current fertility level in Asia is slightly below the estimated world average of 2.8.

Altogether, there are 14 countries in the Asian region where the TFR was at or below replacement level (2.1 children per woman) during the period 1995-2000. Fertility decline is more pronounced in Japan, the Republic of Korea and Singapore, where the TFRs are below 1.6 per woman, while those in China and Thailand are marginally higher at 1.8.

As with fertility, there has been a substantial decline in mortality in Asia. As a result, life expectancy at birth has increased considerably. The average lifespan of a child born in the period 1950-1955 was a little over 40 years, while a child born in 1995-2000 could be expected to live almost 66 years, an increase in life expectancy of more than 50 percent in less than 50 years [United Nations (2001)].

The current life expectancy at birth in Asia is slightly higher than the world average of 65 years. While females in general have an advantage over males in the number of years of life they may be expected to live, the difference tends to widen with the increased life expectancy at birth.

These demographic dynamics (declining fertility, increasing longevity and the widening sex gap in life expectancy at birth) have engendered issues that are emerging as major concerns in Asia in general, and East and Southeast Asia in particular. The implications are far-reaching and profound as they affect the age structure of the population, giving rise to population ageing, labour force shortages, increased elderly dependency ratios and feminisation of the aged population [Moriki-Durand (2003)].

According to Moriki-Durand (2003), some of the consequences of low fertility are; fewer children are born and progressively large numbers of adults move into the older age groups. Changes in the age structure of a population and population ageing are inevitable consequences of low fertility. In the long term, population ageing is not the only radical outcome of persistent low fertility. An old age structure also provides the momentum for a decline in population, just as a young population provides the momentum for accelerated population growth [McDonald (2000)]. Persistent decline in fertility, increased longevity and the widening gap between female and male life expectancies at birth also result in an increase in the old-age dependency ratio and feminisation of the elderly population. The signs of consequences of the low fertility are becoming evident in China, Japan, Korea, Singapore and Thailand.

According to Freedman (1995) the much slower rate of change in India than in China is related to a more limited capacity to implement the family planning programme at the village level and to a smaller reduction in mortality and illiteracy. Even in India, however, fertility has fallen to replacement levels in several poor states, with their traditionally greater female autonomy and their progress in mortality reduction and literacy.

The substantial, completely unexpected, fertility decline in Bangladesh is forcing a major revision of theories about fertility decline. This was crystallised by an effective family planning programme, which gained credibility and direction from the successful Matlab pilot project. Fertility has fallen considerably more in India and Bangladesh than in Pakistan, where the transition has hardly begun. This is because the Pakistani government has made little progress in implementing its family planning programme or in reducing mortality and illiteracy [Freedman (1995)].

According Siddiqui, *et al.* (2006) in their recently published book "Gender and Empowerment: Evidence from Pakistan", the empirical evidence in Pakistan shows that there is a rise in female Labour Force Participation Rate (LFPR) since 1990s. The increase in the female LFPR supports the view of feminisation of labour force in Pakistan. But the employment rate among the females has not increased, resulting in a sharp rise in the female unemployment rates relative to the male unemployment rate. The characteristic of the female labour force in Pakistan is their concentration in a few occupations and industries. They are employed in agriculture, services (domestic), and in manufacturing (small-scale) industries. Community services and farm production are the main occupational categories.

The information on the health and nutrition status of the population, particularly, female population is not very encouraging. The data from the Population Census 1998 and the surveys conducted by the authors have pointed towards changes in marriage rates, fertility, and use of contraception. Economic hardships slow down the marriage rates as revealed in the reported increased number of never-married persons by gender, place of residence, and level of education. The increased poverty level has resulted in the higher cost of raising children. The sustained decline in fertility, threefold increase in contraception use by males, and choice of the most effective contraceptive methods that provided longer duration of protection against pregnancy were indicative of a changed approach towards the reproductive process. The combined effect of the economic factors may produce a major impact on the fertility level in Pakistan even without much increased prevalence of contraception [Siddiqui, *et al*. (2006)].

IV. SYNTHESIS

Currently over half of the world population is living below 2-dollar a day poverty line but according to the UN projections, fertility in developing countries will drop to an average of 2.1 children by 2050 and eventually to 1.85. To make it

possible to achieve sustainable population in poor countries, factors like literacy and education; employment opportunities both for men and women and in urban and rural areas; income distribution; good governance; investment in social sector; improvement in contraceptive access and supply need special attention. With regards to environment, enactments of regulations to control environmental degradation and strict implementation of such regulations have been successful in many countries. The need is to set priorities.

According to Crafts (2000), the classic statement of the theory of the demographic transition is a dominant paradigm in both development economics and economic history. The approach is that of a stage theory of development in which societies pass from a low population growth phase in which both birth and death rates are high through a phase of rapid population growth in which modernisation causes mortality to decline and then, after a lag, fertility to decline to a mature phase in which both birth and death rates are low and population growth is once again modest. Widely interpreted to imply that 'development is the best contraceptive', this vision, based on impressions of historical European experience, contained both good news and bad news. While eventually economic development would solve the population problem because modernisation changes the economics of childbearing, in the short term it would inevitably exacerbate demographic pressure.

The changing costs of contraception and changing tastes influences the desired family size as well as the more obvious income and female wage variables. The European fertility decline occurred almost simultaneously in countries at very different stages of economic development. The pre-decline fertility was quite variable and well below the biological maximum and that the cultural setting influenced the spread of birth control. A clear implication was that family planning programmes had much greater potential to influence fertility, even at low levels of development, than the proponents of transition theory would have imagined.

Many economic historians are happy to emphasise the importance of culture in fertility outcomes. At the same time, even they recognise that it is quite unclear either what are the decisive aspects of culture or to what extent this might operate through influence on the diffusion of birth control (contraceptive costs) or through changing ideas on the acceptability of small or childless families (tastes). It should also be remembered that more narrowly economic factors related to the costs of children like women's employment opportunities and schooling provision seem to have impacted on fertility during the decline.

The relationship between population growth and incidence of poverty has been debated for more than a century. The carrying capacity of the planet is also debated among various schools of thought. With rapid industrialisation and its impact on ecological balance has given the debate a new dimension. This paper has tried to analyse these debates. There is a general consensus among four groups that population growth has some relationship with environment and poverty but the

debate is whether population growth is a cause or effect and if policies can do something to control population.

Pakistan is a typical example of Malthusian school of thought because higher population growth has eroded fruits of higher economic growth. Although Pakistan has witnessed higher economic growth, it is unable to adjust its economic structure. Higher population growth has implication for natural resources. Pakistan has to incur huge expenses on importing food items like edible oil, wheat and pulses. Pakistan could not replicate the industrial countries' transition because of its inability to modernise agriculture or develop industrial base. In Pakistan population growth is a cause for poverty, environmental degradation and high debt levels.

Pakistan has to control population explosion for various reasons. Pakistan has socio-religious problems which are hampering its development efforts. Effective population planning is a must for Pakistan.

During the 1990s there has been consistent effort to forge unification between the concepts of economic sustainability and ecological sustainability. Now even Neoclassical Economists admit that in relation to expanding economic demand, environmental resources are finite and shrinking. A number of Neoclassical Economists [Arrow, *et al*. (1995)] suggest in their research that this situation calls for a prudent use of the natural resources to maintain a sustained level of economic growth. They also believe that even with limitations to carrying capacity, it may be possible to attain both sustained economic growth together with an increase in population. The key to this is efficient natural resource management. In order to attain sustainable natural resource management co-evolution needs to take place where environmental and economic processes are selected on the bases of their complementarity [Bergh (2001)].

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Comments

I understand that the paper presented by Seeme Mallick and Naghmana Ghani is a good review of literature on the relationship between poverty, population growth and environment. They have rightly pointed out that all schools agree on the relationship between poverty, population growth and environment and that these schools of thought provide contrasting explanations for this link and come up with divergent policy options for attaining sustainable population growth.

The authors have done a good job by putting together thoughts of various authors or schools and their followers. However, what do they think is correct and in what perspective. They need to do some more analysis and come up with specific and conclusive prescriptions for various countries and regions in different circumstances. The European fertility transition took more than two centuries to complete. Whereas, countries like Sri Lanka, South Korea, North Korea, Thailand, Kazakhstan, Iran, Turkey, Tunisia, Mauritius, China, Singapore have completed fertility transition in 2-4 decades. It needs to be explored what factors made it possible? Similarly, relatively poorer and more populous countries like India, Indonesia, and Bangladesh are nearing replacement level fertility and may get there before the end of this decade. In many of these countries strong family planning programmes have been noted for independent effect on hastening fertility transition in rather adverse socio-economic conditions.

Factors like good governance; literacy and education; employment opportunities both for men and women and in urban and rural areas; income distribution; investment in social sector; improvement in contraceptive access and supply will make it possible to achieve sustainable population in poor countries. Enactments of regulations to control environmental degradation and strict implementation of such regulations have been successful in many countries. The need is to set priorities. Currently over half of the world population is living below 2-dollar a day poverty line but according to the UN projections, fertility in developing countries will drop to an average of 2.1 children by 2050 and eventually to 1.85 children.

I think the authors need to look for empirical evidence of fertility decline in the developing world in the past 3-4 decades and the factors that made it possible and then relate it to the earlier theories of Malthus, the classical and neoclassical economists and the dependency theorists and then make their own conclusion.

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